

Piezoelectric Flexible Streamers for Hydroelectric Alternative to Dams

Sometime in 2023

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Introduction

Hydroelectric and wind-based energy generation remains an important area for research and development and leaves a great deal of room for improvement, particularly with relation to the cost of construction of hydroelectric and wind-based electrical generating mechanisms. A novel approach which does not require heavy, expensive turbines and, in the case of wind turbines, excessively tall stanchions, would be consequential for our ability to generate electrical power.

Abstract

Given the recent advent of piezoelectric materials which generate electricity when the material is bent in one direction or the other, it should be possible to harvest energy both from flowing water and flowing air using clusters of long, hair-like streamers which; in the case of hydroelectric application; are submerged, particularly in conjunction with fixed turbulators which maximize the torsion applied to the streamers despite the unidirectional flow direction of the water.

Each energy collection mechanism would consist of a pair of pylons driven into the bed of a river. The first pylon would have the general shape of an aircraft wing i.e. it is flat on one side and curved on the other. This shape, just as in aerodynamic lift, results in the induced rotation of the fluid and in the generation of a semi-stable vortex which would have the effect of applying torsion to the piezoelectric streamers, which would be attached to a separate but closely collocated stanchion situated so as to ensure that the mid-point in the length of the streamers reside fall within the center of the generated vortex created by the static turbulating pylons.

As the streamers whip back and forth as a result of interaction with the rotating water, they would generate substantial electricity. Such pylons could be placed throughout the length of a river and could even be used in smaller flowing bodies of water which would not ordinarily not lend themselves to dam construction. They could be used in both tidal and wave-power generating applications. A magnetically active coating could be used to prevent the streamers from becoming tangled.

Conclusion

Such an approach would have the added advantage of being less disruptive to shipping traffic than are dams, which require that ships use a series of locks to allow for their safe passage which require that ships pause for substantial lengths of times at each lock. As these pylons could be made to be soft and flexible, ships could brush into them routinely without causing damage to the pylons and without the pylons damaging the passing ships.